

April 14, 2003

Mr. P. E. Katz, Vice President  
Calvert Cliffs Nuclear Power Plant, Inc.  
Calvert Cliffs Nuclear Power Plant  
1650 Calvert Cliffs Parkway  
Lusby, MD 20657-4702

SUBJECT: CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 -  
AMENDMENTS RE: LEAD FUEL ASSEMBLIES (TAC NOS. MB5646, MB5647,  
AND MB6064)

Dear Mr. Katz:

The Commission has issued the enclosed Amendment No. 258 to Renewed Facility Operating License No. DPR-53 and Amendment No. 235 to Renewed Facility Operating License No. DPR-69 for the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 respectively. These amendments consist of changes to the Technical Specifications in response to your applications transmitted by letters dated July 17 and August 6, 2002.

These amendments permit operation of Calvert Cliffs Unit 2 with a core containing up to eight lead fuel assemblies with fuel rods clad with an advanced zirconium-based alloy.

A copy of the related Safety Evaluation is enclosed. A Notice of Issuance will be included in the Commission's next regular biweekly *Federal Register* notice.

Sincerely,

*/RA/*

Guy S. Vissing Senior Project Manager, Section 1  
Project Directorate 1  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-317 and 50-318

Enclosures: 1. Amendment No. 258 to DPR-53  
2. Amendment No. 235 to DPR-69  
3. Safety Evaluation

cc w/encls: See next page

Calvert Cliffs Nuclear Power Plant  
Unit Nos. 1 and 2

cc:

President  
Calvert County Board of  
Commissioners  
175 Main Street  
Prince Frederick, MD 20678

Kristen A. Burger, Esquire  
Maryland People's Counsel  
6 St. Paul Centre  
Suite 2102  
Baltimore, MD 21202-1631

James Petro, Esquire  
Counsel  
Constellation Power Source  
111 Market Street  
Baltimore, MD 21202

Patricia T. Birnie, Esquire  
Co-Director  
Maryland Safe Energy Coalition  
P.O. Box 33111  
Baltimore, MD 21218

Jay E. Silberg, Esquire  
Shaw, Pittman, Potts, and Trowbridge  
2300 N Street, NW  
Washington, DC 20037

Mr. Loren F. Donatell  
NRC Technical Training Center  
5700 Brainerd Road  
Chattanooga, TN 37411-4017

Mark Geckle  
Calvert Cliffs Nuclear Power Plant  
1650 Calvert Cliffs Parkway  
Lusby, MD 20657-4702

Resident Inspector  
U.S. Nuclear Regulatory  
Commission  
P.O. Box 287  
St. Leonard, MD 20685

Mr. Richard I. McLean, Manager  
Nuclear Programs  
Power Plant Research Program  
Maryland Dept. of Natural Resources  
Tawes State Office Building, B3  
Annapolis, MD 21401

Regional Administrator, Region I  
U.S. Nuclear Regulatory Commission  
475 Allendale Road  
King of Prussia, PA 19406

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cc w/encls: See next page

Package Number: ML

TSs: ML

Accession Number: ML031040504

\*See previous Concurrence

\*\* Input provided by memo dated 1/14/03 incorporated with no significant changes

OFFICE	PDI-1/PM	PDI-1/LA	SRXB/SC**	PDI-1/SC	OGC*
NAME	GVissing	SLittle	FAkstulewicz	RLaufer	RWeisman
DATE	4/03/03	4/03/03	1/14/03	4/04/03	3/27/03

**OFFICIAL RECORD COPY**

DATED: April 14, 2003

AMENDMENT NO. 258 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-53  
CALVERT CLIFFS UNIT 1

AMENDMENT NO. 235 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-69  
CALVERT CLIFFS UNIT 2

PUBLIC  
PDI-1 R/F  
RLaufer  
FOrr  
SLittle  
GVissing  
OGC  
GHill (2)  
WBeckner  
ACRS  
BPlatchek, RI

cc: Plant Service list

CALVERT CLIFFS NUCLEAR POWER PLANT, INC.

DOCKET NO. 50-317

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 258  
Renewed License No. DPR-53

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The applications for amendment by Calvert Cliffs Nuclear Power Plant, Inc. (the licensee) dated July 17 and August 6, 2002, comply with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the applications, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.2. of Renewed Facility Operating License No. DPR-53 is hereby amended to read as follows:

2. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 258, are hereby incorporated into the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

*/RA/*

Richard J. Laufer, Chief, Section 1  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Technical  
Specifications

Date of Issuance: April 14, 2003

CALVERT CLIFFS NUCLEAR POWER PLANT, INC.

DOCKET NO. 50-318

CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NO. 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 235  
Renewed License No. DPR-69

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The applications for amendment by Calvert Cliffs Nuclear Power Plant, Inc. (the licensee) dated July 17 and August 6, 2002, comply with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.2. of Renewed Facility Operating License No. DPR-69 is hereby amended to read as follows:

2. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 235, are hereby incorporated into the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

*/RA/*

Richard J. Laufer, Chief, Section 1  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Technical  
Specifications

Date of Issuance: April 14, 2003

ATTACHMENT TO LICENSE AMENDMENTS

AMENDMENT NO. 258 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-53

AMENDMENT NO. 235 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-69

DOCKET NOS. 50-317 AND 50-318

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages

4.0-1  
4.0-2  
4.0-3

Insert Pages

4.0-1  
4.0-2  
4.0-3

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 258 TO RENEWED  
FACILITY OPERATING LICENSE NO. DPR-53  
AND AMENDMENT NO. 235 TO RENEWED FACILITY OPERATING LICENSE NO. DPR-69  
CALVERT CLIFFS NUCLEAR POWER PLANT, INC.  
CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2  
DOCKET NOS. 50-317 AND 50-318

## 1.0 INTRODUCTION

By letters dated July 17 and August 6, 2002, Calvert Cliffs Nuclear Power Plant, Inc. (the licensee) submitted a request for changes to the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2, Technical Specifications (TSs). The requested changes would permit operation of Calvert Cliffs Unit 2 with a core containing up to eight lead fuel assemblies (LFAs) with fuel rods clad with advanced zirconium-based alloys.

Calvert Cliffs proposes to operate its Unit 2 plant with up to four LFAs containing fuel rods clad with Framatome proprietary zirconium-based M5 alloy, and up to four LFAs containing fuel rods clad with Westinghouse proprietary advanced zirconium-based alloys, so that it may obtain data to support development of new and improved new cladding materials and improved fuel evaluation codes and methods.

## 2.0 BACKGROUND

The Nuclear Regulatory Commission (NRC) staff has already generically approved the use of Framatome M5 fuel for batch loadings in pressurized-water reactors (PWRs) in its review of Topical Report BAW-10227P-A, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel," dated February 4, 2000.

At this time, the Westinghouse proprietary claddings are developmental fuel claddings, which licensees may only use as lead (test) fuel assemblies. This is because the vendor has not presented sufficient data on these claddings upon which to base generic safety evaluations. The number of developmental assemblies must be few enough that they can represent no compromise to safety regardless of their performance. (See Sections 4.1 and 4.5.)

The purpose of the LFAs is to obtain the data needed to justify that the assemblies will perform within the bounds assumed in safety analyses. Once the licensee or vendor has developed sufficient data to perform generic safety analyses and has provided justifying safety analyses,

the NRC staff may review these claddings for batch loadings so that licensees may implement batch reloads with fuel advanced zirconium based claddings.

WCAP-15604-NP, Revision 1, "Limited Scope High Burnup Lead Test Assemblies," contains guidance and standards for participation in a Limited Scope Lead Test Assembly program involving high burnup lead test assemblies. In a letter dated January 7, 2003, W.H. Ruland (NRC) to R.H. Bryan (Westinghouse Owners Group), the NRC accepted WCAP-15604-NP, Revision 1, for referencing in licensing applications. WCAP-15604-NP explicitly addresses itself to high burnup lead test assemblies. However, the staff finds that many of the recommendations in WCAP-15604-NP apply to the LFAs proposed for Calvert Cliffs Unit 2 even if they do not achieve high burnups. In its review of the proposed Calvert Cliffs LFAs, the staff has used applicable recommendations of WCAP-15604-NP, Revision 1.

### 3.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.46 and Appendix K identify requirements for calculating emergency core cooling system (ECCS) performance for reactors containing fuel with zircaloy or ZIRLO cladding, and 10 CFR 50.44 relates, in part, to the generation of hydrogen gas from a metal-water reaction between the reactor coolant and reactor fuel having zircaloy or ZIRLO cladding. Because 10 CFR 50.46, 10 CFR 50.44, and 10 CFR Part 50, Appendix K do not explicitly apply to M5 or the Westinghouse developmental claddings, the licensee has requested an exemption from those regulations to allow implementation of these developmental claddings in the Calvert Cliffs Unit 2 core. In doing so, the licensee provided information to show compliance with provisions from 10 CFR 50.12, "Specific Exemptions."

The underlying purpose of 10 CFR 50.46 is to ensure that nuclear power facilities have adequate acceptance criteria for ECCS. The intent of 10 CFR 50.44 is to ensure that there is an adequate means for controlling accident generated hydrogen. The intent of paragraph I.A.5 of Appendix K to 10 CFR Part 50 is to apply an equation for rates of energy release, hydrogen generation, and cladding oxidation from a metal-water reaction that conservatively bounds all post-loss-of-coolant accident scenarios.

In its submittals, the licensee stated that it has assessed its proposals using the guidance provided in WCAP-15604. The staff used seven "conditions" (as adapted for the Calvert Cliffs LFAs) contained in WCAP-15604 as criteria for its evaluation of the licensee's proposals. Provided that these conditions are satisfied, WCAP-15604-NP is bounding for the use of LFAs as proposed at Calvert Cliffs. The "Conditions of Acceptance" from WCAP-15604-NP, Revision 1, Section 4.0, are edited in the following listing (Section 4.0) to accommodate their application to the Calvert Cliffs LFAs.

#### 4.0 TECHNICAL EVALUATION

The licensee addressed the provisions in WCAP-15604-NP, Revision 1 as follows:

##### 4.1 “The number of...” LFAs “...shall be limited to a total of nine...”

The nine-assembly limit is an appropriate criterion because with this limited number of LFAs the licensee may maintain a high level of confidence that no safety concerns exist as a result of their use. (See Section 4.5)

Calvert Cliffs has proposed up to a total of eight LFAs.

The staff finds the licensee’s proposed number of LFAs acceptable because it is within the limit specified in WCAP-15604-NP, Revision 1.

##### 4.2 “The fuel shall be typical production fuel and be pre-characterized before operation...”

Preconditioning is necessary to provide initial conditions of the fuel for subsequent “before and after” comparisons in evaluating LFA performance.

The licensee has clarified that the fuel will be so pre-characterized and the licensee will provide the information to the NRC.

The staff finds the licensee’s proposed pre-characterization of the LFAs acceptable because it is consistent with the WCAP-15604-NP, Revision 1, condition.

##### 4.3 “The pre-characterization of the fuel shall consist of at least the following examinations: clad oxidation, rod/assembly growth, and visual examinations for PWRs...”

Industry and NRC have found that these characterizations can provide a minimum adequate set of parameters by which to monitor LFA performance. Visual examinations will verify that no pre-spallation or blistering is present.

The licensee has clarified that the pre-characterization of all the LFAs will consist minimally of clad oxidation, rod/assembly growth, and visual examinations. At a minimum, the licensee will provide this information to the NRC.

The staff finds the licensee’s proposed pre-characterization of the LFAs acceptable because it is consistent with the minimum adequate set identified in the WCAP-15604-NP, Revision 1, condition.

##### 4.4 “The post-irradiation examinations of the fuel shall consist of at least the following examinations: clad oxidation, rod/assembly growth, and visual examinations for PWRs...”

Post-irradiation examination would provide quantified measurements of fuel performance for the representative parameters. These measurements could confirm or fail to support expected fuel performance under normal, abnormal, and accident conditions. The licensee has clarified

that it will conduct at least the following examinations of the LFAs: clad oxidation, rod/assembly growth, and visual examinations. The licensee also stated that it would perform visual examinations of the LFAs during the outage between Calvert Cliffs Unit 2 operating cycles 15 and 16. The licensee stated that it would provide the results of all examinations to the NRC.

The staff finds the licensee's proposed post-irradiation examinations of the LFAs acceptable because it is consistent with the minimum adequate set identified in the WCAP-15604-NP, Revision 1, condition.

4.5 "The fuel shall be evaluated against and must meet all current design criteria... Current or modified fuel performance methods and codes shall be used ..."

These analyses would demonstrate that the use of the LFAs in accordance with the program would not be deleterious to the safe operation of the plant, such that it would continue to meet its safety design basis.

The licensee has performed assessments of plant transients and accidents, including LOCA, using methodologies approved for application to Calvert Cliffs, Unit 2. Though the methodologies may not have been approved for licensing-basis analyses for some of the fuel types, the licensee provided information indicating that the LFAs were sufficiently similar in material and geometry to fuels that the methodologies had previously analyzed that the methodologies were adequate for the assessment of LFAs. The licensee's analyses indicate that the LFAs will not affect the present design basis analyses for Calvert Cliffs Unit 2 during Cycles 15 and 16. The licensee attributed this finding in part to positioning of the LFAs in non-limiting locations. The licensee has clarified that it will place the LFAs in locations that represent the normal Calvert Cliffs Unit 2 operational fuel duty, including in "hot" though non-limiting locations. The licensee believes this will provide data representative of the fuel operation and burnup for two cycles.

The staff finds that the safety analyses which the licensee performed are acceptable because they demonstrate that the use of the LFAs in accordance with the program would not be deleterious to the safe operation of the plant, such that it would continue to meet its safety design basis, because the analyses were performed with appropriate assessment methodologies, because they were performed for an appropriate set of event scenarios, because they were performed with acceptable calculated results, and, therefore, the analyses comply with the WCAP-15604-NP, Revision 1, condition.

4.6 "For all fuel rods in the LFAs, the predicted oxidation shall be less than 100 microns used on a best-estimate basis with prediction of no blistering or spallation based on current data."

Failure to meet this as-loaded fuel criterion could indicate that the LFA might not be able to satisfy all of fuel performance expectations and the findings of the safety assessments discussed in Section 4.5. If this were the case, it might not be appropriate to load the fuel into a commercial power reactor.

The licensee has committed to implement this condition. The validity of the evaluations will be based on the use of current fuel design acceptance criteria and appropriate analytical models, which are listed in the TS.

The staff finds the licensee's commitment acceptable because it is consistent with the WCAP-15604-NP, Revision 1, condition.

4.7 "Utilities...shall submit two reports to the NRC for information."

"The first report shall be a notification of intent to irradiate LFAs... It shall contain at least the following information:

- Utility Name
- Plant Name
- Cycle and date when LFA shall be inserted
- Number of LFAs
- Location of LFAs
- Anticipated pre- and post-cycle burnups for each LFA
- Purpose of LFAs estimated dates for pre- and post-irradiation characterizations or the results of the pre-characterization and an estimation of the date for the post-irradiation characterization
- Estimated date of second report
- Statement that the LFAs will not be irradiated if Conditions 5 and 6 are not met or if the pre-characterization examinations show anomalous results.

The second report shall give the results of the pre- and post-irradiation examinations. It shall consist of at least the following information:

- Utility Name
- Plant Name
- Assembly Identification Number
- Specific Measurements -Actual data and predictions
- Comment Section"

These reports will provide the NRC the information it needs to monitor fuel research program progress and performance of the specific developmental fuel. NRC knowledge of any such performance would enhance overall safety by aiding the NRC in responding to any related plant occurrence, and would facilitate the NRC review of the specific fuel for batch loading.

The licensee has committed to implement this condition.

The staff finds the licensee's proposed program for reporting the LFAs acceptable because the number and kind of reports and information contained in them is consistent with the WCAP-15604-NP, Revision 1, condition.

#### 4.8 Conclusion

The staff concludes that the licensee's proposal to operate Calvert Cliffs Unit 2 with up to four LFAs containing fuel rods clad with of M-5, and with up to four LFAs containing fuel rods clad with Westinghouse developmental proprietary cladding is acceptable because the licensee will comply with the LFA program set forth in WCAP-15604-NP, Revision 1, which assures that the licensee may maintain a high level of confidence that no safety concerns exist as a result of the use of the LFAs.

#### 5.0 TECHNICAL SPECIFICATIONS

To accommodate the insertion of LFAs containing fuel rods clad with M5, or Westinghouse developmental proprietary cladding, into the Calvert Cliffs Unit 2 Cycles 15 and 16 core, the licensee proposes to add descriptive inserts to the Calvert Cliffs Unit Nos. 1 and 2 , TS 4.2.1, "Fuel Assemblies." The proposed inserts are:

"For Unit 2 Cycles 15 and 16 only, advanced cladding material from Westinghouse may be used in up to four lead test assemblies, as described in approved temporary exemption dated XX/XX/XX."

and,

"For Unit 2 Cycles 15 and 16 only, advanced cladding material from Framatome-ANP may be used in up to four lead test assemblies, as described in approved temporary exemption dated XX/XX/XX."

The staff finds that the wording "advanced cladding material" in the proposed inserts lacks an appropriate level of specificity with regard to the description of the proposed cladding materials for the LFAs without the added details which the requested exemption provides.

The staff finds that the TS inserts the licensee has proposed, with appropriate specificity provided by the exemption, are acceptable because they are descriptive of the materials to be added to the Calvert Cliffs Unit 2 Cycles 15 and 16 cores, and because they define the applicability and length of time for which the exemption is granted.

In addition, the licensee requested that the TS statements concerning the lead test assemblies the were allowed to be inserted for Unit 1 Cycles 13, 14, and 15 be deleted. Unit 1 completed Cycle 15 in February 2002. Therefore, these statements are no longer applicable and their deletion is acceptable.

#### 6.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Maryland State official was notified of the proposed issuance of the amendments. The State official had no comments.

#### 7.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has

determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (67 FR 58637). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

## 8.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: F. Orr

Date: April 14, 2003